Name: _____   Date: _____
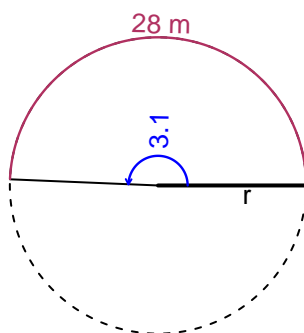
Trig Final (Solution v49)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 3.1 radians. The arc length is 28 meters. How long is the radius in meters?
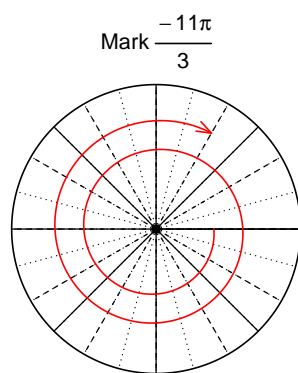

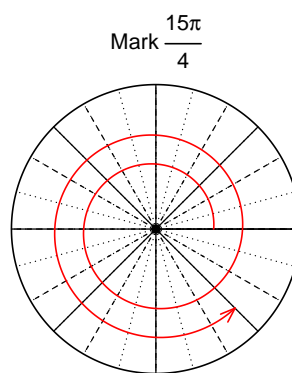$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 9.032$ meters.

Question 2

Consider angles $\frac{-11\pi}{3}$ and $\frac{15\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-11\pi}{3}\right)$ and $\cos\left(\frac{15\pi}{4}\right)$ by using a unit circle (provided separately).

Mark $\dfrac{-11\pi}{3}$

Find $\sin(-11\pi/3)$

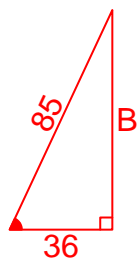$\sin(-11\pi/3) = \frac{\sqrt{3}}{2}$

Mark $\dfrac{15\pi}{4}$

Find $\cos(15\pi/4)$

$\cos(15\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{-36}{85}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.
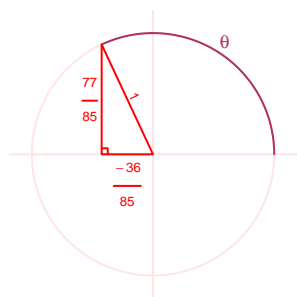

Solve the Pythagorean Equation

$$36^2 + B^2 = 85^2$$
$$B = \sqrt{85^2 - 36^2}$$
$$B = 77$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.

$$\tan(\theta) = \frac{\frac{77}{85}}{\frac{-36}{85}} = \frac{-77}{36}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 4.04 meters, a frequency of 7.91 Hz, and a midline at $y = -5.37$ meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -4.04\cos(2\pi 7.91t) - 5.37$$

or

$$y = -4.04\cos(15.82\pi t) - 5.37$$

or

$$y = -4.04\cos(49.7t) - 5.37$$